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Abstracts

Symposium 5: Morphogenesis

Program/Abstract # 36

Combining modern and classical methods to study morphogenesis mechanisms in *C. elegans*

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Recent work from our lab at UNC and Jeremy Nance and his lab at the Skirball has developed *C. elegans* gastrulation as a new model for studying cellular and molecular mechanisms of morphogenesis. The use of *C. elegans* allows specific methods valuable for dissecting mechanisms in other systems to be combined in a single system — most importantly, methods of forward and reverse genetics, modern live cell imaging, and direct manipulations of cells undergoing morphogenetic movements *in vitro*. We have found that genes and mechanisms known to function in vertebrate neural tube formation and other important morphogenetic events also contribute to *C. elegans* gastrulation movements. We have begun to identify new molecular players as well. I will present the development of this model and our recent findings.

doi:10.1016/j.ydbio.2008.05.039

Program/Abstract # 37

A quantitative analysis of imaging data provides insights into the coordination of cell movements during *Drosophila* gastrulation

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Gastrulation is a conserved yet highly complicated embryonic process combining cell migration and morphological changes, which results in the establishment of different germ layers. In the past, authoritative studies of mesoderm migration have relied on observations of fixed embryos, leaving many questions regarding this dynamic process unanswered. To resolve this, we have conducted an in vivo analysis of embryos with 2-Photon Laser Scanning Microscopy. We have optimized this technique in order to image up to 90mm within an embryo, allowing the capture of the entire process of gastrulation with sufficient spatial and temporal resolution to support tracking of cell trajectories. To our knowledge, this is the first time that mesoderm migration, in its entirety, has ever been observed in *Drosophila*. Imaging under optimized conditions and using specialized software, we can collect quantitative data regarding the behavior of individual or groups of cells as they move in time (i.e. 4D analysis). To describe the observed behaviors, we have developed new methods for analyzing large data sets and decoupling different types of movement within embryos, which we propose will be of general interest to researchers studying the movement of cells. By disassembling the migration into its key components, we have uncovered many new insights including that the dorsal spreading of the mesoderm is directed and that FGF signaling provides a directional cue. Imaging gastrulating *Drosophila* embryos is an excellent model system for the analysis of coordinated cell movement.

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Program/Abstract # 38

The genetic hierarchy that controls gastrulation in *Drosophila*

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Apical constriction of epithelial cells is an important morphogenetic mechanism. In the *Drosophila* embryo the constrictions that lead to the invagination of the mesodermal cell layer depend on properly localized, intact adherens junctions and a contractile actomyosin network. The localization of the junctions and the actin network is controlled by the mesodermal transcriptional regulator Twist. Junctions are disassembled from their initially subapical location under the control of the Twist target Snail, and are reassembled at the apical contact points of mesodermal cells under the control of the mesodermal transcriptional regulator, Twist, via two of its target genes, fog and T48. We will discuss the mechanism by which the junctions are reassembled and precisely patterned.

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Program/Abstract # 39

The calcium channel β subunit is required for morphogenetic movements in gastrulation

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Epiboly, the first morphogenetic movement of gastrulation, involves spreading of blastoderm cap cells over the yolk. The

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